Explain why the fact that all living cells have similar types of DNA molecules is important to understanding evolution.

1. T/F – It appears that all life-forms had a common evolutionary ancestor with a single genetic code.
2. T/F – The genetic code is described as being completely different in all living organisms.
3. T/F – The differences observed between two human individuals is approximately only 1% of the total DNA.

Recognize the different scientists’ contributions to the discovery of DNA.

1. What is the name of the process that was involved in changing Griffith’s R bacteria to S bacteria?
   1. DNA replication
   2. Polyermization
   3. Transformation
   4. Crossing-over
2. Hershey and Chase showed that:
   1. Bacteriphages can infect human cells
   2. DNA controls heredity
   3. Bacteria undergo transformation
   4. A vaccine for pneumonia could be produced.
3. What is Chargaff’s Observation:
   1. Discovered the double helix shape of DNA
   2. The amount of adenine always equaled the amount of thymine
   3. Mice can change phenotype based on transformation
   4. None of the above

Recognize two pieces of information that enabled Watson and Crick to discover the double helix shape of DNA.

1. Watson and Crick used what two prior pieces of information from other scientists to uncover the shape of DNA (circle two) :
   1. Wilkins and Franklin’s X- Ray diffraction pictures
   2. Chargaff’s observation of exact amounts of purines and pyrimidines
   3. Griffith’s experiments of vaccines in mice
   4. Avery’s experiments of protein destroying and DNA destroying enzymes

Describe the modular parts of nucleotides and the names of the nitrogen bases.

1. Draw and label the 3 parts of a nucleotide.
2. Name the 4 nitrogen bases in DNA.
3. Circle the two purines:
   1. Cytosine
   2. Guanine
   3. Thymine
   4. Adenine
4. Circle the two pyrimidines:
   1. Cytosine
   2. Guanine
   3. Thymine
   4. Adenine

Explain the structure of DNA, the sequence of the base pairings and how the structure leads to exact copies of itself during replication.

1. In the double helix which molecule composes the backbone (side pieces) of the DNA molecule?
2. In the double helix which molecule composes the “rungs” of the DNA Molecule?
3. How are the two sides of the double helix held together?
   1. Carbon bonds
   2. Hydrogen bonds
   3. Sugars
   4. Phosphates
4. Given the base sequences in the following DNA chain, write the corresponding or complimentary DNA base.

AGTCTTCGAGTACGG

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Where does DNA replication occur?
   1. Cytoplasm
   2. Nucleus
   3. Ribosome
   4. mitochondria
2. During what stage of the life cycle of a cell does DNA replication occur?
   1. G1
   2. Synthesis
   3. G2
   4. Mitosis
3. The DNA enzyme that opens up the double helix during replication is known as:
   1. DNA polymerase
   2. DNA helicases
   3. Replication forks
   4. Phages
4. The DNA enzymes that add complementary nucleotides during DNA replication and proofread the new DNA strand are called:
   1. DNA polymerase
   2. DNA helicases
   3. Replication forks
   4. Phages
5. Multiple replication forks along the DNA:
   1. Correct replication errors
   2. Reduce DNA replication time
   3. Ensure that the new and old DNA strands are complementary
   4. Signal DNA polymerase to stop

Analyze replication of DNA and its importance to heredity.

1. Explain how the quantity of DNA in cells remains the same from generation to generation of cells in terms of the process of replication.

Recall that DNA contains the genetic code for cell to run its chemical factories, create proteins and reproduce.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (s) made in the cytoplasm work to keep the cell alive and also make up amino acids.
2. Several strands of \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_(s) strung together make a protein.

Recognize that multiple nucleotides strung together create different genes that house the genetic code.

1. A stretch of DNA that codes for a certain trait is called a :
   1. Nucleotide
   2. Chromosome
   3. Gene
   4. RNA
2. Genes are expressed in a cell through the production of :
   1. Hormones
   2. Sugars
   3. Proteins
   4. enzymes

Relate how proteins are important to the cell and to the organism:

1. Name 3 functions of proteins in the cell:
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. The two-step process by which cells read a gene and produce a string of amino acids that

will eventually become a protein is called:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Examine the process of transcription and translation in the formation of proteins

1. Match the following key terms with the best match:

\_\_\_Transcription a. The entire process by which proteins are made based on

\_\_\_Translation the information encoded in DNA.

\_\_\_gene expression b. RNA instructions written on the mRNA

\_\_\_condons c. Takes place in the cytoplasm

\_\_\_anticodon d. Instructions transferred from a gene to RNA

\_ e. Complimentary to mRNA and found on tRNA

1. T/F – Gene expression occurs in two phases: replication and transcription.
2. T/F – Transcription follows the same base pairing rules as DNA replication without exception.
3. Instead of the base, thymine found in DNA, RNA has a based called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and it pairs with the base \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. In eukaryotes, long segments of nucleotides with no coding information are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
5. In eukaryotes, the portions of a gene that are actually translated into proteins are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Differentiate DNA from RNA

1. Describe 3 differences between RNA and DNA.
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Interpret mRNA codons, tRNA anti-codons and amino acids from original DNA gene sequences.

1. Given the following DNA sequence and using our Genetic code table, interpret the mRNA, the amino acid and the tRNA for the following:

DNA - TACAACGGTCTCAGCACGATT

mRNA\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

amino acid \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

tRNA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Given the following DNA sequence and using our Genetic code table, interpret the mRNA, the amino acid and the tRNA for the following:

DNA - AGTCCTTGCATAAGCAATCC

mRNA\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

amino acid \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

tRNA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Propose how Gene combinations cause variations, organisms with new capabilities or can be deleterious.

1. Circle the two types of point mutations:
   1. Exchange
   2. Insertions and Deletions
   3. Substitution
   4. Translocation
2. A mutation that causes a gene to be read in the wrong three-nucleotide sequence is called:
   1. Chromosome mutation
   2. Frame-work mutation
   3. Mutagen
   4. Inversion mutation.
3. T/F – If a mutation changes the original amino acid sequence of the protein, the protein may not function normally.
4. T/F – A mutation could create a completely different protein within the cell or even cause cell death.
5. T/F – Any agent that can cause a change in DNA is called a mutagen.
6. T/F – Control of gene expression is required for cells to become specialized.
7. T/F – Gene regulation does not allow cells to differentiate in the early developmental stages of an organism.
8. A mutation can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_ if it helps the organism survive.
9. A mutation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ if the organism is unaffected.

Discuss how only mutations in gametes can be passed to future generations and mutations in somatic cells will not.

1. A Deer is born normal, but UV rays cause a mutation in its retina. Which of the following statement is least likely to be true?
   1. The mutation may be passed on to the offspring of the deer.
   2. The mutation may cause retinal cancer.
   3. The mutation may interfere with the function of the retinal cell.
   4. The mutation may interfere with the structure of the retinal cell.
2. A female lab rat is exposed to X rays. Its future offspring will be affected only if a mutation occurs in the rat’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cells.
3. Match the following terms to their definitions:

\_\_\_\_\_Deoxyribose a. substance that speeds up a chemical reaction

\_\_\_\_\_DNA b. opens the double helix for replication

\_\_\_\_\_ribose c. sugar found in DNA

\_\_\_\_\_RNA d. Deoxyribonucleic Acid

\_\_\_\_\_replication e. moves along DNA adding nucleotides

\_\_\_\_\_enzyme f. Ribonucleic Acid

\_\_\_\_\_ DNA Polymerase g. sugar found in RNA

\_\_\_\_\_DNA Helicase h. process of making a copy of DNA

49. In your own words, explain DNA’s role in passing down traits from generation to generation.

50. Explain how the mapping genes in the human genome project could be important to understanding human genetics and diseases.